

Serial No. -- 10/628,856

Docket No. GMC 0051 PA/40320.56

Amendments to the Claims

The following listing of claims will replace all prior versions, and listings, of claims in the present application:

1. (currently amended) A process for fabricating ~~[[a]]~~ diffusion media, said process comprising:

providing a diffusion media substrate comprising a porous fibrous matrix defining first and second major faces, wherein said substrate is free of fluorinated polymers and comprises an amount of carbonaceous material sufficient to render said substrate electrically conductive;

applying a mesoporous layer along at least a portion of one of said first and second major faces of said substrate to define a region carrying said mesoporous layer and regions outside of said mesoporous layer, wherein said mesoporous layer is applied to said fluorinated polymer free substrate by providing a coating comprising a hydrophobic component, a hydrophilic component, and a pore forming agent, and said substrate is regions outside of said mesoporous layer are free of fluorinated polymers ~~outside of regions of said substrate carrying said mesoporous layer;~~ and

decomposing said pore forming agent such that said mesoporous layer is characterized by a porosity greater than a porosity of said diffusion media substrate.

2. (original) A process as claimed in claim 1 wherein said hydrophobic component comprises a fluorinated polymer.

3. (original) A process as claimed in claim 2 wherein said hydrophobic component comprises PTFE.

4. (original) A process as claimed in claim 1 wherein said coating is provided as a mixture comprising between about 15 wt% and about 40 wt% of said hydrophobic component.

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5. (original) A process as claimed in claim 1 wherein said coating is provided as a mixture comprising about 20 wt% of said hydrophobic component.
6. (original) A process as claimed in claim 1 wherein said hydrophilic component comprises a carbonaceous substance.
7. (original) A process as claimed in claim 6 wherein said carbonaceous substance is selected from carbon fibers, carbon particles, and combinations thereof.
8. (original) A process as claimed in claim 6 wherein said carbonaceous substance is characterized by a surface area of between about 50 cm²/g and about 250 cm²/g.
9. (original) A process as claimed in claim 6 wherein said carbonaceous substance is characterized by a surface area of about 60 cm²/g.
10. (original) A process as claimed in claim 6 wherein said carbonaceous substance comprises acetylene black.
11. (original) A process as claimed in claim 1 wherein said coating is provided as a mixture comprising between about 60 wt% and about 85 wt% of said hydrophilic component.
12. (original) A process as claimed in claim 1 wherein said coating is provided as a mixture comprising about 80 wt% of said hydrophilic component.
13. (original) A process as claimed in claim 1 wherein said pore forming agent comprises a material selected such that said mesoporous layer is substantially free of components of said pore forming agent upon decomposition of said pore forming agent.

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14. (original) A process as claimed in claim 1 wherein said pore forming agent comprises a material selected to decompose in a mixture with said hydrophobic and hydrophilic components upon heating above room temperature.

15. (original) A process as claimed in claim 14 wherein said pore forming agent comprises a material selected such that said decomposition is particulate free.

16. (original) A process as claimed in claim 14 wherein said pore forming agent comprises a material selected such that said decomposition comprises gaseous and liquid components.

17. (original) A process as claimed in claim 14 wherein said pore forming agent comprises a material selected such that said decomposition comprises at least one gaseous component and H₂O.

18. (original) A process as claimed in claim 1 wherein said pore forming agent comprises ammonium carbonate.

19. (original) A process as claimed in claim 1 wherein said coating is provided as a mixture comprising between about 0 wt% and about 15 wt% of said pore forming agent.

20. (original) A process as claimed in claim 1 wherein said coating is provided as a mixture comprising about 5 wt% of said pore forming agent.

21. (original) A process as claimed in claim 1 wherein a sufficient amount of said mesoporous layer is applied to said substrate to substantially increase a porosity of said diffusion media relative to said diffusion media absent said mesoporous layer.

22. (original) A process as claimed in claim 21 wherein said substantial increase in said porosity of said diffusion media is between about 5% and about 15%.

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23. (original) A process as claimed in claim 21 wherein said substantial increase in said porosity of said diffusion media is about 7.5%.

24. (original) A process as claimed in claim 21 wherein said porosity of said diffusion media including said substrate and said mesoporous layer is about 84%.

25. (original) A process as claimed in claim 1 wherein said coating further comprises a solvent selected from H₂O, isopropanol, and combinations thereof.

26. (original) A process as claimed in claim 1 wherein said coating is provided such that it at least partially infiltrates said diffusion media substrate.

27. (original) A process as claimed in claim 1 wherein a sufficient amount of said mesoporous layer is applied to said substrate to substantially increase an overall porosity of said diffusion media from about 78% absent said mesoporous layer to about 84% including said mesoporous layer.

28. (original) A process as claimed in claim 1 wherein a sufficient amount of said mesoporous layer is applied to said substrate to yield a mesoporous layer thickness of between about 10 μ m and about 25 μ m.

29. (original) A process as claimed in claim 28 wherein said diffusion media substrate is provided having a thickness of between about 100 μ m and about 300 μ m.

30. (original) A process as claimed in claim 1 wherein said pore forming agent is decomposed by a heat treating process.

31. (original) A process as claimed in claim 30 wherein said heat treating process is characterized by temperatures between about 75°C and about 100°C.

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32. (original) A process as claimed in claim 30 wherein said heat treating process is characterized by temperatures above about 65°C.

33. (currently amended) A process for fabricating [[a]] diffusion media, said process comprising:

providing a diffusion media substrate comprising a porous fibrous matrix defining first and second major faces, wherein said substrate is free of fluorinated polymers and comprises an amount of carbonaceous material sufficient to render said substrate electrically conductive;

applying a mesoporous layer along at least a portion of one of said first and second major faces of said substrate to define a region carrying said mesoporous layer and regions outside of said mesoporous layer, wherein

said mesoporous layer is applied to said fluorinated polymer free substrate by providing a coating comprising a hydrophobic component, a hydrophilic component, a pore forming agent, and a solvent,

said hydrophobic component comprises a fluorinated polymer,

said hydrophilic component comprises a carbonaceous substance selected from carbon fibers, carbon particles, and combinations thereof,

said carbonaceous substance is characterized by a surface area of about 60 cm²/g,

said pore forming agent comprises ammonium carbonate,

said ~~substrate is~~ regions outside of said mesoporous layer are free of fluorinated polymers ~~outside of regions of said substrate carrying said mesoporous layer~~,

a sufficient amount of said mesoporous layer is applied to said substrate to substantially increase a porosity of said diffusion media relative to said diffusion media absent said mesoporous layer,

said substantial increase in said porosity of said diffusion media is between about 5% and about 15%,

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said solvent is selected from H₂O, isopropanol, and combinations thereof, and

said coating is provided such that it at least partially infiltrates said diffusion media substrate; and

decomposing said pore forming agent in a heat treating process such that said mesoporous layer is characterized by a porosity greater than a porosity of said diffusion media substrate.

34. (currently amended) A device comprising [[a]] diffusion media wherein:

said diffusion media comprises a diffusion media substrate and a mesoporous layer;

said diffusion media substrate comprises a porous fibrous matrix defining first and second major faces and an amount of carbonaceous material sufficient to render said substrate electrically conductive;

said diffusion media substrate carries said mesoporous layer along at least a portion of one of said first and second major faces of said substrate to define a region carrying said mesoporous layer and regions outside of said mesoporous layer;

said mesoporous layer comprises hydrophobic and hydrophilic components defining hydrophobic and hydrophilic regions within said mesoporous layer;

said mesoporous layer comprises an amount of carbonaceous material sufficient to render said mesoporous layer electrically conductive;

said mesoporous layer is characterized by a porosity greater than a porosity of said diffusion media substrate; and

~~said diffusion media substrate is~~ regions of said substrate outside of said mesoporous layer are free of fluorinated polymers outside of regions of said substrate carrying said mesoporous layer.

35. (original) A device as claimed in claim 34 wherein said mesoporous layer is characterized by pore sizes between about 1nm and 1µm.

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36. (original) A device as claimed in claim 34 wherein:

said hydrophobic component comprises a fluorinated polymer;

said hydrophilic component comprises a carbonaceous substance selected from carbon fibers, carbon particles, and combinations thereof;

said carbonaceous substance is characterized by a surface area of about 60 cm²/g;

said mesoporous layer at least partially infiltrates said diffusion media substrate;

said diffusion media substrate is characterized by a porosity of about 78% outside regions of said substrate carrying said mesoporous layer; and

said diffusion media is characterized by an overall porosity of about 84%.

37. (currently amended) A device as claimed in claim 34 wherein said device further comprises ~~structure defining a fuel cell employing said diffusion media;~~

a membrane electrode assembly interposed between an anode flow field and a cathode flow field of a fuel cell;

said membrane electrode assembly comprises an ion exchange membrane positioned between respective catalytic electrode layers of said membrane electrode assembly; and

said diffusion media is positioned such that said mesoporous layer is positioned against a catalytic electrode layer of said membrane electrode assembly.

38. (original) A device as claimed in claim 37 wherein said device further comprises structure defining a vehicle powered by said fuel cell.